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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/617,958	07/11/2003	Horii Hideki	5649-1114	4471
20792	7590	06/08/2004	EXAMINER	
MYERS BIGEL SIBLEY & SAJOVEC			NGUYEN, THINH T	
PO BOX 37428			ART UNIT	PAPER NUMBER
RALEIGH, NC 27627			2818	

DATE MAILED: 06/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/617,958

Applicant(s)

HIDEKI, HORII

Examiner

Thinh T Nguyen

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-- Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 7/11/2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 12-18, 21-23 and 47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 12-18, 21-23 and 47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED OFFICE ACTION

1. Claims 1-9, 12-18, 21-23, 47 are pending in the Application.

Specification

2. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant cooperation is requested in correcting any errors of which the applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102(b/e) that form the basis for the rejections under this section made in this office action.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 1-4, 47 are rejected under 35 U.S.C. 102(b) as being anticipated by the Applicant Admitted Prior Art (the AAPA).

REGARDING CLAIM 1

The AAPA discloses (fig 3) a phase changeable memory device comprising: an integrated circuit substrate; a first storage active region (fig 3 reference 40) on the integrated circuit substrate having a first width; a second storage active region on the integrated circuit substrate having a second width; and a transistor active region (fig 3 reference 10) on the integrated circuit substrate between the first and second storage active regions, the first and second widths being less than a width of the transistor active region.

REGARDING CLAIM 2

The AAPA discloses (fig 3) a phase changeable memory device wherein the first width is equal to the second width and the first and second widths are about half of the width of the transistor active region.

REGARDING CLAIM 3

The AAPA discloses (fig 3) a phase changeable memory device comprising a plurality of gate lines defining a plurality of rows of the phase changeable memory device, wherein a plurality of the first and second storage active regions are disposed alternately along the rows in a region between first and second gate lines of the plurality of gate lines and wherein the widths of the first and second storage active regions and the width of the transistor active region are parallel to the plurality of gate lines.

REGARDING CLAIM 4

The AAPA discloses (fig 3, the top view of the structure) a phase changeable memory device wherein the transistor active region comprises first and second sidewalls extending from a first end of the transistor active region to a second end of the transistor active region, wherein the first storage active region protrudes from the first sidewall of the transistor active region at the

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first end of the transistor active region and wherein the second storage region protrudes from the second sidewall of the transistor active region at the second end of the transistor active region.

REGARDING CLAIM 47

The AAPA discloses (fig 3) a phase changeable memory device comprising: an integrated circuit substrate; a first storage active region on the integrated circuit substrate having a first cross sectional area; a second storage active region on the integrated circuit substrate having a second cross sectional area; and a transistor active region on the integrated circuit substrate between the first and second storage active regions, the first and second cross sectional areas being less than a cross sectional area of the transistor active region.

Noted that due the symmetric nature of the MOSFET, the source and drain names are interchangeable.

Claim Rejections - 35 USC § 103

5. The following is a quotation of U.S.C. 103(a) which form the basis for all obviousness rejections set forth in this office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (the AAPA fig 3) in view of Kuriyama (U.S. patent 6,030,548).

REGARDING CLAIM 5

The AAPA (fig 3) discloses all the invention except for a connector region between the first and the second transistor. Kuriyama (column 3 lines 53-57) teach how to fabricate a structure wherein a connecting region is formed between two active regions of two adjacent transistors.

It would have been obvious to one of ordinary skill in the art the time the invention was made to complement the teachings of the AAPA with the teachings by Kuriyama in order to come up with the invention of claim 5.

The rationale is as the following:

A person skilled in the art at the time the invention was made would have been motivated to reduce the size of his device as suggested by Kuriyama in his abstract.

7. Claim 6,7 ,16,17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (the AAPA fig 3) in view of Wu (US patent 6,545,903) .

REGARDING CLAIM 6,7

The AAPA (fig 3) discloses all the inventions except for a lower plug that connect the active storage region. Wu; however, teaches how to couple an active storage element to an active storage region using a lower plug (fig. 2a) and use the lower plug as heater element (column 2 lines 42-43).

It would have been obvious to one of ordinary skill in the art the time the invention was made to complement the teachings of the AAPA with the teachings by Wu in order to come up with the invention of claim 6 or 7.

The rationale is as the following:

A person skilled in the art at the time the invention was made would have been motivated To improve the thermal and electrical efficiency of the device as suggested by Wu (column 4 lines 5-6) in his disclosure.

REGARDING CLAIM 16,17

Wu teaches the fabrication of a buffer layer (fig 2a, layer 142 and 122) and an upper plug (fig 2a, the combination of 3 conductive layers 140,138,120 form the upper plug).

It would have been obvious to one of ordinary skill in the art the time the invention was made to combine the teachings by Wu with the teachings of the AAPA in order to come up with the inventions of claims 16,17.

The rationale to complement the teachings of the AAPA with the teachings by Wu has been discussed in the rejection of claim 6-7 above.

8. Claim 8,9,12,13,18,21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (the AAPA fig 3) in view of Wu (US patent 6,545,903) and in further view of Reinberg et al. (US patent 5,952,671).

REGARDING CLAIM 8,18

The combined teachings by the AAPA and Wu disclose all the inventions except for barrier pattern. This, feature ,however , has become old and well known in the art as shown in column 8 lines 47-57 in the disclosure by Reinberg et al.

It would have been obvious to one of ordinary skill in the art the time the invention was made to combine all the teachings of the AAPA, Wu and Reinberg et al. in order to come up with the invention of claim 8 or 18 for a purpose of improving the semiconductor device.

REGARDING CLAIM 9,12,13

Wu (fig 1a,column 2 lines 41-43) disclose a structure of a phase change memory device wherein the upper plug is of smaller diameter than the lower plug and the lower plugs serve as heating plugs.

The rationale to complement the teachings of the AAPA with the teachings by Wu and Reinberg et al.has been discussed in the rejection of claim 8,18 above.

REGARDING CLAIM 21

Wu(fig2a) shows a structure of phase change memory device with intermediate Heating plug (fig 2a, layer 122a).

The rationale to complement the teachings of the AAPA with the teachings by Wu and Reinberg et al.has been discussed in the rejection of claim 8-18 above.

9. Claim 14,15,22,23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (the AAPA fig 3) in view of Wu (US patent 6,545,903) and in further view remark.

REGARDING CLAIM 14,15,22,23

The combined teachings of the AAPA and Wu disclose all the inventions except for the limitation of a common source plug connected to an common source interconnection that is disposed in the interlayer dielectric layers.

These features, however are considered obvious since they are old and well known in the art (to decrease the memory cell size) as shown by the disclosure by Brassington et al. (US patent 5,350,705). (fig 3, the abstract, column 2 lines 52-54) .

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A person skilled in the art at the time the invention was made would have been able to make a common source plug connected to an common source interconnection that is disposed in the interlayer dielectric layers without any special teachings.

10. When responding to the office action, Applicants are advised to provide the examiner with the line numbers and the page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

11. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to be abandoned (see M.P.E.P. 710.02(b)).

12. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d) which papers have been placed of record in the file.

CONCLUSION

13. The prior arts made of record and not relied upon are considered pertinent to applicant disclosure: Ovshinsky et al. (US patent 5,341,328) disclose an Electrically erasable memory elements having reduced switching current requirements and increased write/erase cycle life

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14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thinh T Nguyen whose telephone number is 571-272-1790.

The examiner can normally be reached on Monday-Friday 9:00am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached at 571-272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Thinh T. Nguyen 
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David Nelms
Supervisory Patent Examiner
Technology Center 2800